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Clinical Significance of Endoscopic Retrograde Chorangiography (ERC) on Operated Cases

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Introduction

The diagnostic value of endoscopic retrograde cholangiopancreatography (ERCP) has been clearly established for pancreatico-biliary disease.

ERCP was found to provide more important information on not only changes in gastro-duodenal, pancreatic and biliary tracts, but also on anastomosis at the time of surgical operation.

Without clear visualization of the bile duct, selection of the operative method for biliary disease is very difficult.

Recently, the use of endoscopic sphincteropapillotomy and endoscopic retrograde biliary drainage have facillitated the application for therapy. But, in most cases, surgical treatment for biliary disease is still necessary. Therefore the focus of biliary tract must be satisfactorily determined before operation.

This study was performed in order to elucidate the clinical implication of these techniques in patients who underwent endoscopic retrograde cholangiography (ERC) and operation.

Materials and Method

Among the 412 patients examined using ERC because of suspicion of biliary disease from 1980 to 1982 in Thushimi surgical hospital, 171 were studied; their diagnosis were confirmed by biopsy, operation and clinical course. The indications for ERC investigation are shown in Table 1.

Including ERC, percutaneous transhepatic cholangiography (PTC) and percutaneous transhepatic cholecystography (PTCC) were performed for the surgical biliary disease (Table 2). Among 189 patients who underwent operation, ERC was performed on 109 patients, PTC on 35 patients and PTCC on 6 patients. Among 171 patients who were investigated by ERC, 109 patients underwent the operation; the remaining 62 patients had cholelithiasis, hemangioma

Key words: ERC, Ultrasound, Operation, Classification, Biliary disease.
索引語：ERC，超音波，手術，分類，胆道疾患.
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Table 1. Indications for ERCP.

1. Suspicion of surgical pancreatico-biliary disease by liver function test
2. Differential diagnosis from biliary congestion.
3. Suspicion of pancreatico-biliary disease by Ultrasound screening and visualization of bile duct is needed.
4. Suspicion of dilatation of bile duct and no visualizing gallbladder by drip infusion cholangiography.
5. Upper abdominal indefinite complaint.

of liver, hepatic biliary congestion, liver cirrhosis. Cholelithiasis was diagnosed accurately by ultrasound (US) and drip infusion cholangiography. Other definite diagnosis were confirmed by liver biopsy.

Fifty-nine patients having no biliary disease from the clinical investigation and/or clinical course were compared with them. There are various classifications for biliary figures. For example, Alonso-Lej classification and others for congenital dilatation of the common bile duct, for the abnormalous pancreatico-cholangio connection, distal choledochal obstruction and for the intrahepatic disease.

As visualized by ERC surgical biliary diseases generally cause stenosis, therefore biliary figure were classified into 7 types according to the site of stenosis.

Type I : No stenosis elsewhere.
Type II : Stenosis at the hepatic peripheral branch.
Type III : Stenosis at the right or left hepatic duct.
Type IV : Stenosis at the bifurcation of both hepatic ducts.
Type V : Stenosis at the common bile duct.

Table 2. Diagnostic method in surgical biliary disease.

	No of cases	No of ERC	No of PTC	No of PTCC
Cholecystolithiasis	113	53	5	3
Choledocholithiasis	24	21	6	
Intrahepatic calculi	2	2		
Cholecystocholedocholithiasis	18	14	1	
Intrahepatic calculi	1	1		
Cholocystitis (without stone)	8	7	1	1
Polyp of gallbladder	3	1		
Congenital choledochal cyst	1	1		
Cyst of hepatic duct	1	1		
Adenoma of papilla	1	1		
Choledochal cancer	8	4	11	
Cancer of gallbladder	4	2	2	2
Cancer of pancreas head	6	3	7	
Biliary stricture (metastasis of stomach cancer)	2	1	2	
TOTAL	189	109	35	6

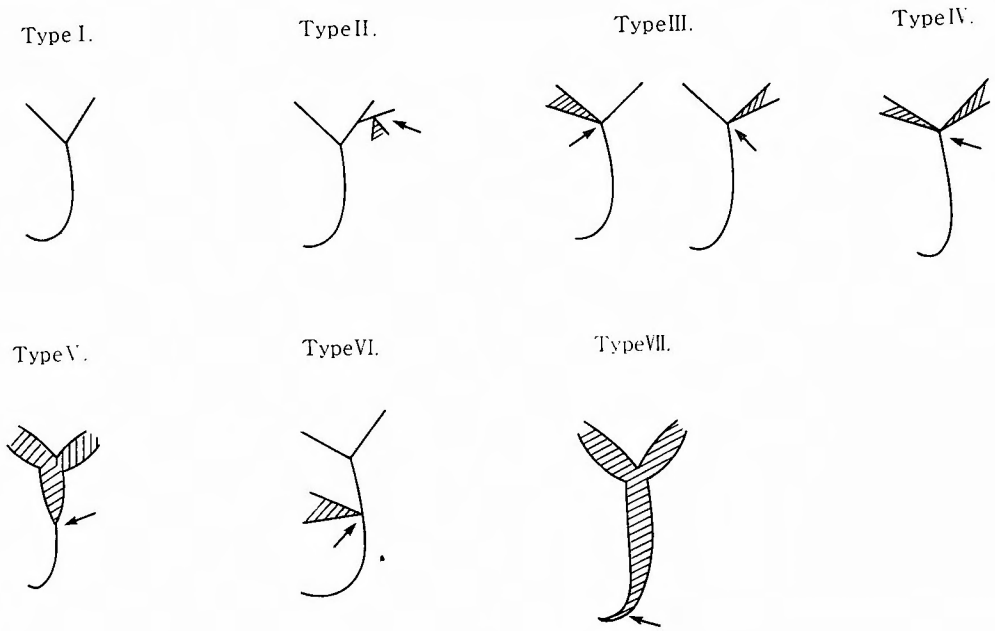

Fig. 1. Classification of Biliary figure by ERC.

Type VI : Stenosis at the cystic duct.

Type VII: Stenosis at the distal common bile duct.

This classification did not take into account the range of stenotic dilatation. (Fig. 1)

The techniques of ERCP are almost the same as the conventional maneuver; namely, premedication with Buscopan 20 mg IM and atropin 0.5 mg IM, and pharynx analgesic with Xylocaine 30 min. before the examination. Just before the insertion of the scope, Pethilorfan 50 mg is injected. Usually, at left lateral position, the scope was inserted to the bulvus, and subsequently to the second portion at the ventral position; then canulation to the papilla was performed under direct vision through a side viewing duodenoscope. Photographs were usually taken in the left lateral position and dorsal position.

After removing the scope, photographs were taken in the ventral and dorsal position, though occasionally, they were taken in various positions.

Results

The study was performed on 59 patients whose bile ducts were visualized as normal. The average maximum diameter of the common bile duct and the incidence of visualization of intrahepatic biliary trees were compared with ages (Table 3).

Diameter of the common bile duct tended to increase with age. There was no significant difference regarding the incidence of visualization of the intrahepatic branch with age.

Table 3. Influence of age on normal bile duct.

Age	30-40	40-50	50-60	60-70	70-80	80-90
Average maximum diameter	5 mm	5-8	5-8	7-9	7-11	11
Visualization of hepatic branch	3 rd branch	3	3	2	2	2

Visualization of the 3rd branch of the intrahepatic bile duct was obtained by usual ERC. Surgical biliary diseases were divided according to the biliary figure seen by ERC (Table 4). Cholecystolithiasis without cholecystitis, choledocholithiasis or choledochocholecystolithiasis was seen in Type I. In Type II, there was only intrahepatic calculi, but if surgery had been attempted on the liver abscess, cholangitis, and calori's disease, they may have been shown to be Type II. InType III, there was also intrahepatic calculi, the figures of which appeared as a defect in either left or right hepatic duct or as the light and shade of contrast media. We have experienced a cyst in the hepatic duct in a rare case, which was of Type III. The stenosis of hepatic duct without dilatation and peripheral hepatic branches were visualized well. In Type IV, choledochal cancer of hilus was seen. PTC was performed because ERC gave only the figure of the distal choledochus.

In Type V, choledochal cancer in most cases were similar to those in Type IV. One case of Mirizzi syndrome was included in type V. In Type VI, showed cholecystitis, cholelithiasis and gallbladder cancer. All cases of cholecystitis without gallstone found to be of Type VI, and half of cases with cholecystolithiasis were Type VI.

Among 155 patients who were operated because of cholelithiasis, 36 patients (24%) were found to be of Type VI. Non-visualizing gallbladder by ERC was of Type VI. Relationship with operative findings are shown in Table 5. Non-visualizing gallbladder indicated the presence

Table 4. Surgical biliary diseases according Type of biliary figure.

	I	II	III	IV	V	VI	VII
Cholecystolithiasis	27				1	25	
Choledocholithiasis	2					5	19
Intrahepatic calculi		1	1				
Cholecystocholedocholithiasis	1	1	1			6	11
Intrahepatic calculi	1						
Cholecystitis without stone						7	
Polyp of gallbladder	1						
Congenital choledochal cyst							1
Cyst of hepatic duct			1				
Adenoma of papilla							1
Choledochal cancer				1	3		
Cancer of gallbladder						2	
Cancer of pancreas head							3
Biliary stricture (metastasis of stomach cancer)							1

Table 5. Surgical findings of non-visualizing gallbladder.

Incarceration	20
Thickening of cystic wall	36
Atrophy of gallbladder	1
Filling with gallstones	5
Empyema or Hydrocyst	22
Gangrene	14
Bile peritonitis	2
Cholecystoduodenal fistula	2
Cancer of gallbladder	2

of cholecystitis namely, empyema, Hydrocyst, gangrene, thickening of cyst wall in most cases. Careful investigation was made because the 2 cases of cancer of gallbladder had non-visualizing gallbladder.

Comparing ERC with ^{99m}TcPI for Type VI, all of the cases in which the gallbladders were not visualized by ERC were also not visualized by ^{99m}TcPI.

Comparisons of the diagnosis using US with that after operation are shown in Table 6. In the cases of non-visualizing gallbladder, 36 patients were identified as having cholelithiasis by operation. Incidence of diagnostic accuracy by US was 90%. Atrophy of gallbladder and incarceration of small stones at the cystic duct were not diagnosed by US, but it was valuable that the findings of cholecystitis were revealed by using US.

Thus, US is very effective for the non-visualizing gallbladder. And PTCC should be performed to obtain the clear figure of gallbladder. In Type VI, cancer of pancreatic head, choledocholithiasis and abnormalous pancreatico-cholangio connection were found. There were 10 patients with abnormalous pancreatico-cholangio connection among 412 patients who underwent ERCP. Also biliary figures of 9 patients were revealed as the Type VII, except for one patient who was of Type I. Six patients were operated among 9 patients with abnormalous pancreatico-cholangio connection because of complication. They included one patient with cholecystolithiasis, 3 with choledocholithiasis, one patient with choledochal cancer and one with cancer of gallbladder.

Some patients had gastrointestinal diseases complications among 171 patients who underwent ERC (Table 7). In these complications, 24 patients had gastroduodenal ulcer. Thus, when

Table 6. Comparison of Diagnosis by Ultrasound (US) with surgical diagnosis in Type VI.

	Diagnosis by US	Surgical diagnosis
Gallstone	28	31
Thickening of cystic wall	29	36
Dilatation of gallbladder	40	42
Atrophy of gallbladder	0	1
Cancer of gallbladder	1	2

Table 7. Complication of Biliary disease.

	No. of case	No. of operation
Gastric ulcer	14	2
Duodenal ulcer	10	2
Gastric polyp	7	5
Polyp of colon	2	2
Cancer of colon	3	3
Stomach Cancer	2	2
Diverticula of colon	1	0
Total	39	16

Table 8. Classification by ERC and performed operation.

Type	Performed operation
I	Cholecystectomy. Sphincteroplasty
II	Left lobectomy. Intrahepatic drainage. Sphincteroplasty
III	Left lobectomy, right extended lobectomy. Choledochojejunostomy
IV	Total bile duct resection
V	Segmental resection of liver. Choledochojejunostomy
VI	Cholecystectomy. Wedge resection of liver
VII	Pancreatico duodenectomy. Sphincteroplasty Total pancreatectomy Choledochoduodenostomy

hepatobiliary diseases are identified, exploration of the gastrointestinal tract should be performed. Comparisons of classification by ERC with performed operation are shown in Table 8.

Two out of 3 patients who had intrahepatic calculi underwent cholecystectomy and sphincteroplasty but the operations were not effective for intrahepatic calculi.

Cases

Case 1: The US for screening was performed on a female complaining of upper abdominal pain. Choledocholithiasis was suspected by US. ERC performed to obtain the detail information of choledochus showed Type II+Type VII, and stenosis, dilatation and stone shadow were identified at the left peripheral hepatic duct and common bile duct. Bilirubin stones were found at the common bile duct and intrahepatic duct. therefore left hepatectomy and sphincteroplasty were performed. (Fig. 2)

Case 2: A Female who had an episode of cholecystectomy and sphincteroplasty visited our hospital complaining of right hypochondrial pain. US demonstrated intrahepatic calculi. ERC was performed, and stones were found at the common bile duct and intrahepatic duct. The figure was revealed as Type III with a defect of peripheral hepatic duct. Left hepatectomy was performed.

Multiple cyst and stones were noted in the left liver. (Fig. 3, 4)

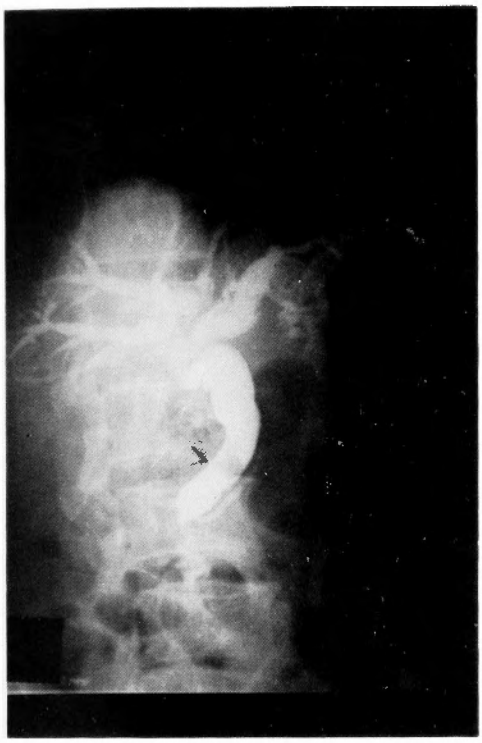

Fig. 2.

Fig. 3.

Fig. 2. Stenosis of distal common bile duct and left 3rd. branch is noted. Gallstones are found at the dilated bile duct (arrows) —Type II+III—.

Fig. 3. Sphincteroplasty was performed at the last operation. No visualization of left hepatic duct (arrow). Dilatation of common bile duct was noted. Stone shadows were seen in common bile duct and left hepatic duct. —Type III+VII—

Case 3: US was performed because of epigastrial pain and ERC was performed since US demonstrated abnormal findings. Right extended lobectomy and reconstruction of bile duct were made because common bile duct cancer was suspected by ERC. Choledochoscopy could not be inserted because of no dilatation of common bile duct. Resected specimen of liver showed a cyst of hepatic duct. Excessive surgery was performed for the benign disease because of representation of Type III by ERC. If careful investigation before operation and further confirmation by intraoperative cholangiography had been made in this case, the excessive surgery may have been prevented. (Fig. 5, 6)

Case 4: US performed because of a complaint of right hypochondrial colic pain revealed a tumor in the gallbladder. As the gallbladder was not visualized by ERC, ERC and PTCC were performed simultaneously. (Fig. 7, 8) By this method, cancer of gallbladder was diagnosed accurately. Cholecystectomy was performed along with enbloc wedge resection of an adjacent 5 cm of normal liver. Resected specimen of gallbladder showed adenocarcinoma which extended to the propria muscle layer. (Fig. 9)

Case 5: A female was admitted to our hospital complaining of right hypochondrial tumor and dull pain. US demonstrated the tumor-like shadow beneath the liver, but no tumor was

Fig. 4. Resected specimen of liver.
Multiple cysts formation and bilirubin stones are recognized. Fibrosis is seen around the bile duct.

Fig. 5. Stenosis of right hepatic duct (arrow).
A tumor appears to be invading to right hepatic duct. — Type III—

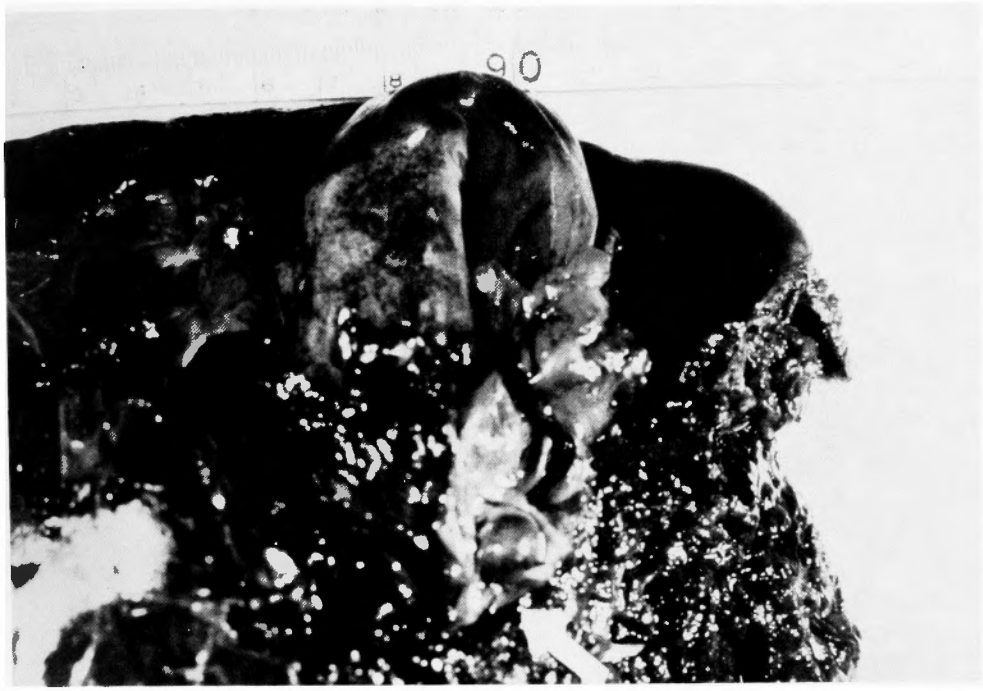

Fig. 6. Appearance of resected specimen of liver. Right extended lobectomy was performed. Upper arrow shows the common bile duct. Low arrow shows the cyst of hepatic duct.

identified. By ERC, slight irregular pooling of contrast media was noted at the site of gallbladder. Operative findings showed the cholecyst-duodenal fistula with intensive cholecystitis. (Fig. 10)

Case 6: This patient was admitted for the first time to this hospital because of right hypochondrial colic pain and high fever. US demonstrated the gallbladder stones and thickening of the cystic wall. But, gallbladder was not visualized by ERC. Operative findings showed cholecystitis with stones and parcial necrosis of the wall. (Fig. 11, 12, 13)

Case 7: A male was sent to this hospital because of jaundice. Choledochal cancer of hilus was suspected by US. The biliary figure was of Type IV by ERC and PTC. Hiler hepatic resection with intrahepatic cholangio-jejunostomy and lymphnode dissection were made. (Fig. 14, 15)

Case 8: A female visited this hospital complaining of epigastric pain and nausea. Incarceration of stone at the distal common bile duct was visualized by ERC and US. Choledocholithotomy and sphincteroplasty were performed. As she had been suffering from the epigastrial dull pain and hyperamylasemia for 2 months after operation, ERCP was performed again. ERCP revealed the dilatation of main pancreatic duct with stone. Parcial pancreatectomy was made, and the resected pancreatic specimen showed a bilirubin stone at the main pancreatic duct.

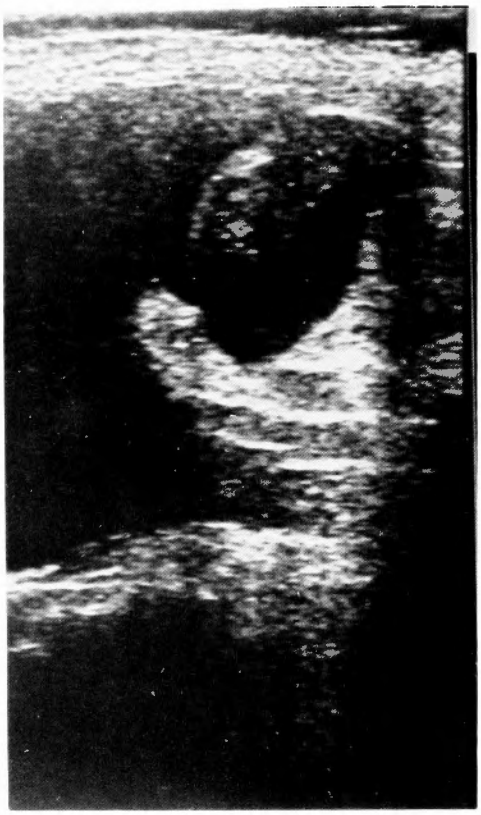

Fig. 7.

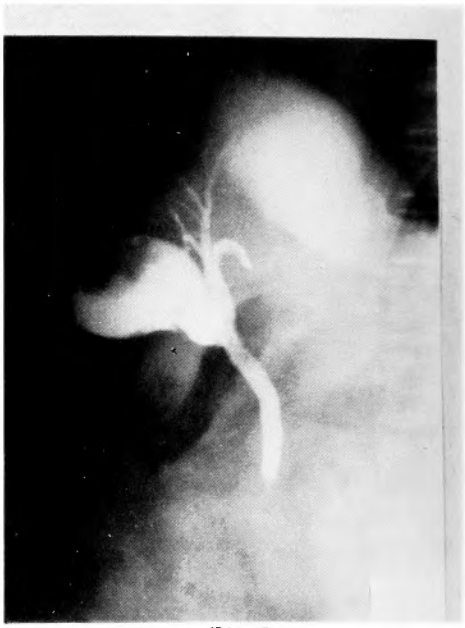

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Fig. 10. Slight irregular pooling of contrast media at the site of gallbladder (small arrow). Large arrow shows the duodenal diverticula —Type VI—.
Fig. 11. US showed the typical hypertrophy of cystic wall and gall stones.

Discussion

Recently the dagnostic accuracy and limit using ERCP has been reported to be 80%[1,6,10]. In this study 109 patients underwent the ERC among 189 patients who were operated because of bilary disease; ERC clarified the nature and focus of bile duct in 68 patient (62%). The remaining 80 patients were diagnosed by methods other than ERC. If these patients were counted, the incidence of diagnostic accuracy would be 35%. On the assumption of biliary surgery, the incidence of diagnostic accuracy of ERC presents many problem.

The success of excretory cholangiography including DIC and ^{99m}TcPI is critically dependent on efficient hepatic excretion of the contrast agent. If the serum bilirubin concentration is greater than 2 mg/dl–8 mg/dl[3,4], non-opacification occurs, however, in regard to ^{99m}TcPI. Our experience suggests that the chances of satisfactory opacification are negligible, if the serum bilirubin level is over 6 mg/dl. US, ERCP, PTC and CT scanning may opacify the biliary tree in patients too jaundiced for excretory cholangiogrophy. Direct cholangiography is very useful for deciding the operative indication and operative method. KUNO[5] reported on the indication

Fig. 7. US shows the tumor without moving in the gallbladder.
Fig. 8. Use of ERC with PTCC.
Tumor of gallbladder is visualized (arrow). Diagnosis of cancer of gallbladder was made.
Fig. 9. Resected specimen of gallbladder.
This adenocarcinoma (30×22 mm) extended to the propria muscle layer.

Fig. 12. No visualization of gallbladder by ERC —Type VI—.

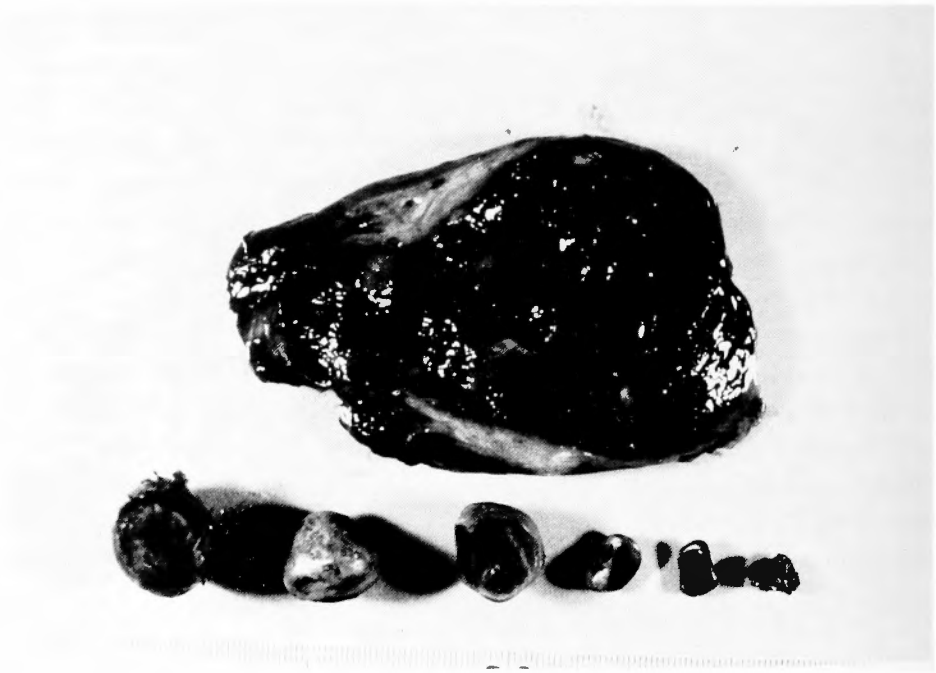

Fig. 13. Resected specimen of gallbladder.
The findings of specimen are the same as those of US.

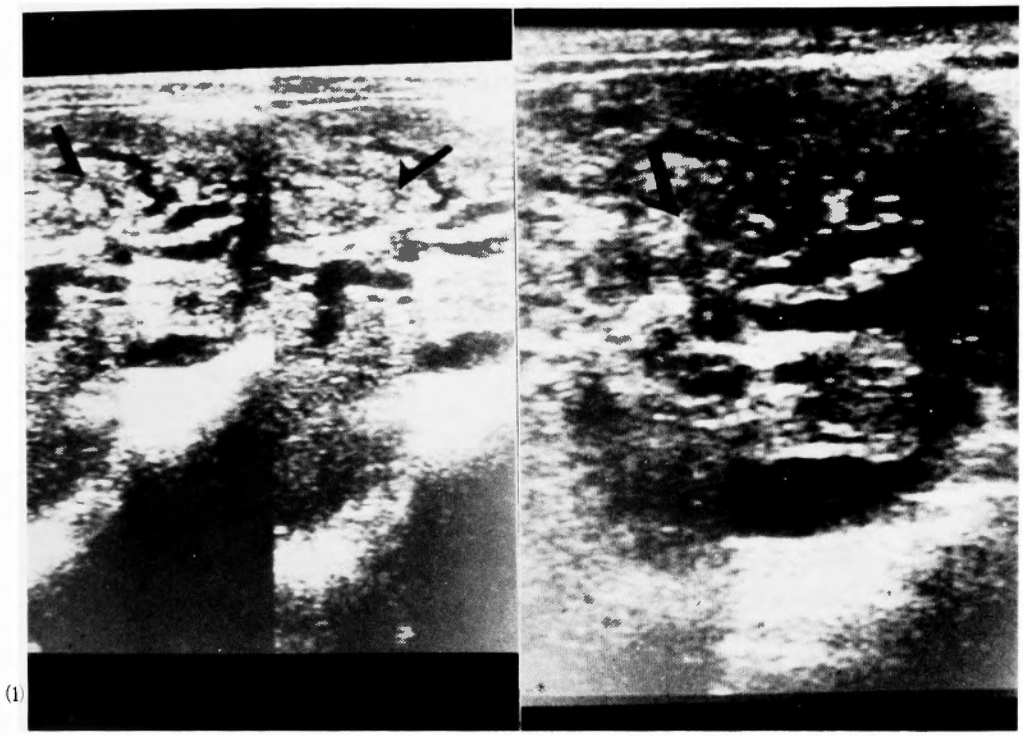

Fig. 14. (1) US showed the dilatation of intrahepatic duct and tumor (arrow).
(2) Magnified picture of US.

of ERCP.

The first indication in our hospital is the confirmation of abnormal findings by US screening, there were many cases diagnosed accurately by US. The combination of US and ERC improve the incidence of diagnostic accuracy.

MILLBOURN[2,11] pointed out that the diameter of common bile duct bears a definite relationship to one of the main pancreatic ducts from the findings of autopsy.

The normal common bile duct averages from 4.0 to 6.5 mm in diameter and 8 mm was considered to be within upper normal limits. By our measurement, it tended to dilate with age.

In investigating the biliary figure, influence by age should be noted. Visualization of the intrahepatic bile duct was not relevant to age.

Visualization of the 5th–6th branches of the intrahepatic bile duct is needed for the diagnosis of intrahepatic disease. Use of pharmacological ERCP[15] may be of diagnostic value. US, CT and selective angiography are performed in the diagnosis of intrahepatic lesion because we consider the ERC is not effective for diagnosing intrahepatic lesion.

Biliary figure visualized by ERC were classified into 7 types from the findings of cholangiography, obstruction, stenosis, distal dilatation, irregularity, displacement and rigidity are characteristic. Stenosis occurs in surgical biliary disease and this has an important relationship to the operative indication and method. For these reasons, biliary figures visualized by ERC are classified into 7 type. As aforesaid, the incidence of diagnostic accuracy by ERC is low on

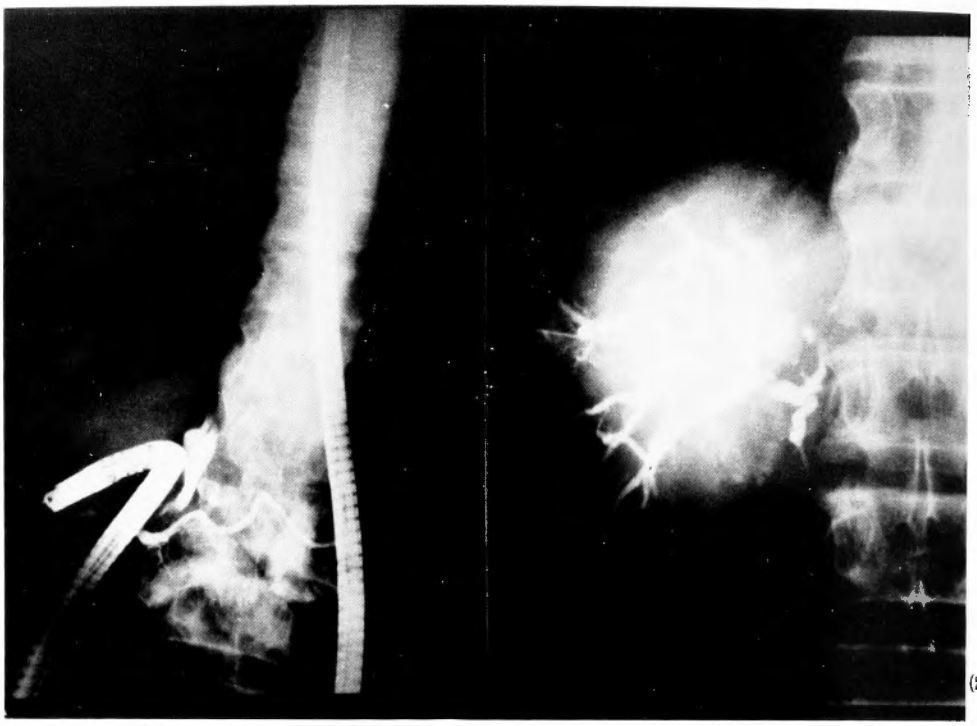

Fig. 15.

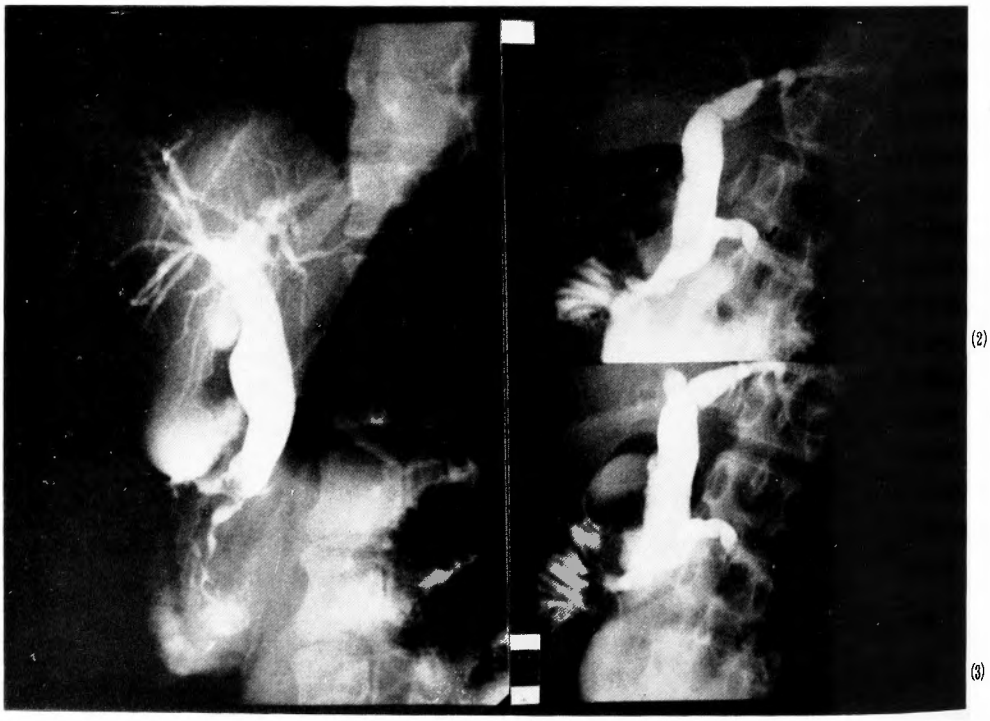

Fig. 16.

the assumption of biliary surgery.

The causative main factor for the reduced diagnostic accuracy of ERC is non-visualizing gallbladder classified as Type VI Usually, when the gallbladder is not visualized entirely, despite sufficent opacification of the bile duct, it has been subjected to surgical treatment[5]; the pathological findings of the non-visualizing gallbladder were reported to be incarceration of stone at the cystic duct, filling with stones, atrophy, hydrocyst and cancer of gallbladder[5,7,9,12].

However, non-visualizing gallbladders may indicate surgical treatment because of some pathological findings, as shown in Table 5.

The high incidence of gangrene in the gallbladder and bile peritonitis is seen in patients over age 60 years old. Thus, in view of age, non-visualizing gallbladder should be treated carefully. It is important to assume the presence of a lesion in the gallbladder when deciding the operative method. Performing surgical treatment for only the reason of non-visualizing gallbladder is questionable. Combination of US is very useful when assuming the presence of a lesion of bile duct and gallbladder, and we consider that US can demonstrate the findings of cholecystitis sufficiently. As shown in case 4, if the malignant lesion of gallbladder is suspected, PTCC with USshould be performed, and the operative method can be decided satisfactorily using PTCC.

It is clear that non-visualizing gallbladder requires US. The majority of choledocholithiasis is recognized in Type II. III. IV. but stones are not always found in the dilated bile duct. As mentioned above, we must take into consideration of not only the dilatation of common bile duct with age but also the dilatation by abnormalous pancreatico-cholangio connection.

When the diameter of the common bile duct is more than 11 mm, it can be regard as an abnormal dilatation. As YAMAKAWA[16] reported, common bile duct exploration and endoscopic examination are indicated to prevent stone retention. Also when the dilatation of common bile duct is found, in addition to the endoscopic examination, combination of operative cholangiography and operative US are useful because endoscopic examination may miss the stone.

Gastrointestinal diseases are known to be complicated with cholelithiasis. They were also recognized in our investigation as shown in Table 7. The coexistent of a benign ulcer interferes with the surgical treatment. In general we perform surgical treatment on females of advanced age who have cholelithiasis even if they have a silent stone. But, coexsistent benign ulcer cause considerable confusion in deciding the operation. The treatment for cholelithiasis of advanced aged patients presents many problems.

Biliary disease classified into 7 types were compared with the performed operation.

Cholelithiasis was seen in Type I. Operation on cholecystolithiasis presents no problem, but there are some problems in the cases of choledocholithiasis without dilatation. Which is the proper operation, only choledocholithotomy or drainage procedures?

Drainage procedures are prefered in our hospital because it is very difficult to insert the

Fig. 15. (1) Gallbladder and intrahepatic duct was not visualized by ERC.
(2) Dilated hepatic ducts were visualized by PTC.

Fig. 16. (1) Stones at the distal common bile duct are visualized by ERC.
(2) (3) 2 months later, ERCP was performed, dilatation of main pancreatic duct and stone shadow are visualized. Arrow shows the bilirubin stone.

choledochoscope in the bile duct without dilatation. Also the pathogenesis of stone formation is largely unknown at present. Sphincteroplasty and other drainage procedure are reasonable for Type I. Choledocholithiasis including intrahepatic calculi were found in Type II and Type III. Sphincteroplasty was not effective to the intrahepatic calculi. Two out of 3 patients with intrahepatic calculi underwent reoperation and they have had an episode of sphincteroplasty.

It is important to consider whether the investigation of ERC was performed satisfactorily or not and further operative exploration would have been necessary. In Type III, when stenosis is present in the left hepatic duct, left lobectomy which is easy to perform safely should be performed as a radical operation. If the presentation of both stenosis is suspected by ERC, hepatic resection using the operative method by HIKASA[2] should be performed. Lithotomy using US by SATOH[13] may be useful, but excretion of stones is impossible if the site of stenosis is removed.

Reconstruction of bile duct with resection of stenosis should be performed. A diagnosis using ERC can not be made in Type IV and Type V. If the contrast media pass through the stricture portion, cholangitis and DIC may be easily induced. Therefore, PTC and PTCD should be performed and ERC should be performed carefully.

According to the fundamental policy to resect the stricture portion, total bile duct resection with one of stricture portion should be performed in benign cases, and total bile duct resection with segmental resection of liver and lymphnode dissection should be performed in malignant cases. In Type VI, if it is benign, there are no problems in performing cholecystectomy.

Two resectable cancers of gallbladder which attain to m and pm without hepatic invasion were included in non-visualizing gallbladders. Cholecystectomy was performed along with en bloc wedge resection of an adjacent 5 cm of normal liver and dissection of lymph nodes in the hepatoduodenal ligament. Operated patients survive more than 2 to 2.5 years after operation. In these cases, malignant lesion was suspected by US, and PTCC was performed. When a protuberant lesion in gallbladder is found, cytological diagnosis and cholecystography using the direct puncture of gallbladder under US should be performed. It is desirable to detect early cancer of gallbladder and it affects on the prognosis because operation for advanced cancer of gallbladder is not effective at present. There are many cases of early cancer in Type I and Type VI. Thus, it is very important to use the US as screening in Type I and Type VI.

The reconstruction of bile duct should be performed for choledocholithiasis with abnormalous pacreatico-cholangio connection. Sphincteroplasty was performed for one abnormalous pancreatico-cholangio connection.

Choledochal stone recurred after operation. Therefore, sphincteroplasty should have been performed carefully.

Sphincteroplasty was performed to the incarceration of stone at the distal common bile duct. But, 2 months after operation, there was bilirubin stone in the main pancreatic duct.

Therefore when the sphincteroplasty is performed, careful exploration and operative pancreatography should be performed when necessary. Radical operation including the total pancreatectomy was performed for malignant diseases. Three patients whose lesions were located at the pancreatic head underwent total pancreatectomy, only one patient survived. In case of

pancreatic cancer, total pancreatectomy should be performed on the basis of investigation intraoperative US and operative pancreatography, and total pancreatectomy should not be carried out with a view of only skip lesion theory[14].

Summary

A study was made on the significance of ERC in the diagnosis of 171 cases of biliary disease, particularly 109 operated cases from 1980 to 1982, in addition 59 normal cases were also studied. Results were as follows:

1) The incidence of diagnostic accuracy was 62% on operated cases.

2) Biliary figure visualized by ERC were classified into 7 types among 109 operated cases.

3) The common bile duct tended to dilate with age. Common bile duct exploration and endoscopic examination were indicated when the diameter of choledochus is more than 11 mm.

4) No visualization of the gallbladder by ERC indicates surgical treatment in most cases. US is very useful in gallbladder disease, and the incidence of diagnostic accuracy was increased in combination with US.

Careful treatment was needed for non-visualizing gallbladder of advanced age patients.

5) Complicated disease with cholelithiasis are gastric or duodenal ulcer in most cases.

6) Careful investigation of ERC before operation should be performed for intrahepatic calculi. Sphincteroplasty is not effective for intrahepatic calculi. Intraoperative US should be used in biliary diseases.

7) Sphincteroplasty should be performed carefully; the indication of sphincteroplasty should be discussed before performance.

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和文抄録

手術症例における ERC の臨床的意義

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1980年迄に ERC を施行し，診断の確定した171例を研究対象とし，特に手術を施行しえた109例につき検討した．又，対象として59例の正常像を年令的に検討し，以下の成績を得た．

1) 胆道外科を前提とすれば ERC は62%に有用であった．

2) 手術しえた109例を ERC 像より I 型から VII 型に分類しえた．

3) 正常像において，胆管は加令と共に拡張する傾向があり 11 mm 迄は正常と思われる．

4) ERC による胆嚢不影例は大部分において病変が認められ，手術適応と考えて良い．

又，胆嚢病変は US で十分確認できるものであり，術前に施行すれば ERC の診断能は向上する．高令者の胆嚢陰性例は重症のものが多く，臨床症状と合わせて早急の対処が必要である．

5) 胆石症に伴う消化器系の合併疾患は胃十二指腸潰瘍が大部分であった．

6) 肝内結石症に対して術前に ERC を十分検討をする必要があった．又，肝内結石症に対して乳頭形成術は無効であった．手術に際しては US を利用した手術を行うべきである．

7) 乳頭形成術は安易に行うべきでなく，適応を十分検討した上で施行されねばならない．